

SECRET KEYS TO A STEM DEGREE

**The Wisdom I Wish I Had While Pursuing an
Engineering Degree**

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Keys to a STEM Degree

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Resources for This Presentation

Justin's Website: JustinRittenhousePhD.com

- Contact me with any questions
- Sign up for my mailing list to stay up to date

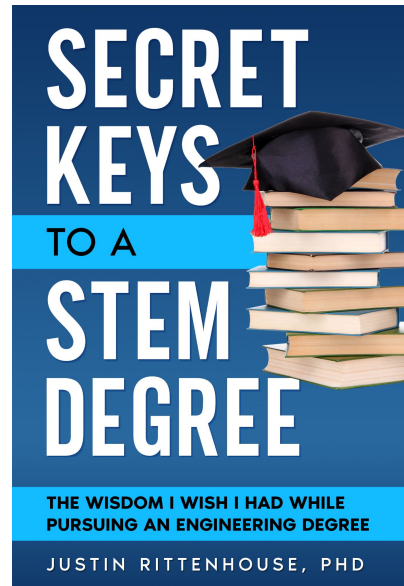
Justin's LinkedIn: linkedin.com/in/justin-rittenhouse-phd

- Connect with me on LinkedIn
- Explore my background, experience, and work

Links to My Book:

[Amazon](#)

[Barnes & Noble](#)



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If you have any questions or need advice, please feel free to reach out. You can leave a comment below, send me a DM on LinkedIn, or contact me through my website.

While this lecture is based on this book, it would be impossible to put 256 pages into a 1-hour (or so) presentation. Thus, it is highly recommended that you read the book as well! It's packed with good information and real-world examples.

On Amazon and Barnes & Noble, just search the book title "Secret Keys to a STEM Degree" and my name, Justin Rittenhouse. You may need to include both for it to appear.

Everyone Struggles More Than You Think

About 70% of people experience impostor syndrome at some point in their lives.¹

You are not alone

- ❖ Everyone has strengths and struggles
- ❖ Experience helps, but doubt never fully disappears
- ❖ Even now, I still have doubts

A life with no risk leads to poverty – financially, emotionally, and spiritually.

Stop

- ❖ Talking yourself out of success
- ❖ Letting others talk you out of success
- ❖ Making excuses
- ❖ Choosing the easy way out
- ❖ Letting fear control your life

Start

- ❖ Doing
- ❖ Trying
- ❖ Failing
- ❖ Trying again

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Explain what impostor syndrome is

Left Column:

Estimates vary widely by study (and I believe it's higher).

The point remains: neither you nor I are alone.

Experience taught me this: we're all human.

Everyone has classes that feel natural and others that take more effort.

The struggle does not disappear with success. Experience helps, but impostor syndrome never fully goes away.

Even now, I still have doubts. I have negative internal dialogue as I read these sentences.

Taking a path with no risk should never be an option. It almost always leads to poverty—financially, emotionally, and spiritually.

Right Column:

Start trying, failing, and trying again until you succeed.

*“Someone’s opinion of you
does not have to become
your reality.”*

- Les Brown

Chapter 1: Introduction

Background

- ❖ I was not an outstanding high school student
- ❖ I knew I couldn't stock groceries forever

Why this book exists

- ❖ To support current and future STEM majors
 - For high school, college, and non-traditional students

Key message for this chapter

- ❖ There is no timeline on a degree
 - No one checks how long it took
 - No one knows your full story or the challenges you faced

Industry experience

- ❖ **Whirlpool** (Fortune 500) — Engineering Analyst
- ❖ **J. Rettenmaier USA** — Process Engineer
- ❖ **Glassmaster Controls** — Engineering Manager; Project Design Engineer
- ❖ **Denso** (Fortune 500) — Intern (Quality & R&D); Co-op (Test Lab)

Academic experience

- ❖ **WMU** — Part-Time Instructor
- ❖ **MVNU** — Assistant Professor, Mechanical Engineering
- ❖ **WMU** — Graduate Research & Teaching Assistant

Education

- ❖ **PhD** — Mechanical Engineering, WMU
- ❖ **MS** — Aerospace Engineering, WMU
- ❖ **BS** — Aerospace Engineering, WMU

Tell the story about Spike the milkman.

I mainly bring this up because I discuss opinions vs. advice in my book. The key idea is that opinions come from those without experience, while advice comes from those with experience. And I have significant experience in both academia and industry.

Chapter 2: Is College Right for You?

Why you should go to college

- ❖ STEM careers can be fun and rewarding
- ❖ STEM majors have robust job markets
- ❖ Nearly a third of jobs that once required only a high school diploma now require a four-year degree²
- ❖ 88% of millionaires graduated from college³

What people say:

“I have a degree, but it was a waste of money because I don’t use it.”

What they actually mean:

“My career is not in the area of my major.”

Why you shouldn’t go to college

- ❖ Avoid unnecessary college debt
- ❖ Pursue your own passions and ideas
- ❖ Skilled trades are a strong alternative
 - Especially if your goal is a high income

Remember

- ❖ There is no fixed timeline for college
 - Colleges have existed for hundreds of years
 - Starting at 20 instead of 18 does not derail your life

The media over-glorify the trades. They conveniently leave out that working in the trades can involve long hours, physically demanding labor that may cause long-term damage to the body, and exposure to harsh weather conditions.

To drive home the point that any bachelor’s degree is better than none, consider this common phrase: “I have a degree, but it was a waste of money because I don’t use it.”

Now consider the people you’ve heard say that. How many of them have at least a decent job requiring soft skills, such as writing and communication?

Thus, I would argue that those people are using their degree, and what they mean is, “My career is not in the area of my major.”

Can college be free?

Yes

No

n0000-yes

Chapter 3: Methods to Minimize Educational Costs

Why minimize?

One in eleven suicides of young professionals is related to student loans.⁴

Apply for many scholarships

- ❖ Not limited to “smart” students
- ❖ Small scholarships add up
- ❖ Think about what makes you unique

Scholarship resources

- ❖ Professors, professional societies, college websites, government websites, etc.

Additional ways to save

- ❖ Utilize community colleges
- ❖ Skip remedial and/or freshman-level classes
 - Talk to your advisor
 - ALEKS exams

Open-source options can reduce software expenses

- ❖ [FreeCAD.org](https://www.freecad.org/), [Python.org](https://www.python.org/), [LibreOffice.org](https://www.libreoffice.org/) (or Google Workspace), etc.

Left Column:

Student loans are a serious issue, and they do create long-term stress that no one should take lightly.

I apologize for the disturbing facts on suicide; however, I would be doing you a disservice if I avoided the subject.

Not limited to students with a past record of academic success.

Talk about my scholarships for my cleft palate and lip and the one from Traverse City. I recall the University of Michigan being a great resource.

Right Column:

Some community colleges are free, or at least the first two years are free.

How many times has a recruiter asked about my minor?

A) Frequently

C) Once

B) A few times

D) Never

Chapter 4: Selecting a Major

Not a life-or-death decision

- ❖ A degree is a career tool
 - The right major strengthens that tool
- ❖ Only 27% of college graduates work in a career closely related to their major⁵

Talk to industry professionals

- ❖ Ask tough questions

Build your network intentionally

- ❖ Attend hiring and career events
 - Many are open to students

Start working in your field early

- ❖ Attend research summer camps
- ❖ Internships or co-ops

Minors may have low ROI

- ❖ Check if they boost your career prospects
- ❖ Don't overthink it for ME or AE

**Mistakes happen:
learn, adjust, and move on**

Left Column:

I see late teens and young adults relying only on their parents, not realizing their parents are only human and don't have endless knowledge.
I attended career events at WMU and had the chance to speak with engineers.

Right Column:

At MVNU, we offered week-long camps for high school students in a variety of majors. I have never seen a job posting that specifies or requires a minor. Instead of pursuing a minor, I recommend Six Sigma, Lean, and other continuous learning courses. They cost less, take less time, and add more value to your resume. Occasionally, you will still make the wrong choice. Learn from it, correct it if possible, and move on.

What do employers value most when hiring new graduates?

A) GPA

C) Real-world experience

B) Number of extracurricular activities

D) Difficulty of courses taken

Chapter 5: Why Gaining Experience Matters and How to Do It

Experience matters

- ❖ Many students focus only on grades
 - The goal of college is employment
- ❖ Real-world experience
 - Companies, like Blue Origin, avoid interns without prior internship experience

Academic opportunities

- ❖ Email professors about TA opportunities
 - If one says no, ask another
 - Keep emails concise and professional

Pick class projects that align with your career goals

Clubs, associations, and professional societies

- ❖ Can help you land your first internship
 - Example: Baja SAE
- ❖ Hands-on experience with industry-standard tools

Tailor your resume to the job

- ❖ Adjust it for each position
- ❖ Resume should be one page

During the interview

- ❖ Show examples of success
- ❖ Tie your answers to your experiences and skills
- ❖ There are no “magic words” in interviews

Right Column:

- They're overly focused on their academic performance and often forget the main reason they're even going to college, which is to increase their employability in their desired field.
- TA = Teaching Assistantship
- Depending on the professor and their level of need, a high GPA isn't always required.

Left Column:

- Tailor your resume – If you are applying for a CAD designer role, tailor your resume to highlight relevant CAD experience from internships or school projects to show you're a strong fit and reduce training needs.
- No “magic words” – Be clear and honest. While there is always room for improvement, there's no perfect answer.

What is the main reason many new hires fail within the first 18 months?

Lack of
technical skills

Lack of
soft skills

Chapter 6: Develop Your Soft Skills

Your personality matters

- ❖ Talent and credentials may land the interview
- ❖ Soft skills and personality land the job
 - They also influence your long-term career growth and promotions
- ❖ 48% of new hires fail within 18 months; 89% of these failures are due to soft skills⁶

Top soft skills

- ❖ Kindness
- ❖ Humility
- ❖ Positive outlook

Build soft skills in college

- ❖ Communication
- ❖ Teamwork (use “we,” not “I”)
- ❖ Presentation skills

Time is a valuable asset; treat it that way

- ❖ Avoid environments where you’re unproductive
 - No one has mastered watching TV while doing focused work
- ❖ Find a focus-friendly space
 - Use tools like music or pink noise to stay concentrated

Right Column:

Don’t take all the credit.

Home is a place where many people end up watching TV while they “work.”

I go to coffee shops and wear headphones.

“One of the worst hiring mistakes that I’ve made in the past is looking too much at their intellectual capability alone and not on how they affect those around them. . . . And it really matters if they have a good heart and personality”

- Elon Musk

Chapter 7: The Importance of Writing Well

I got called out

- ❖ My advisor pushed me to improve early in grad school
 - His advisor told him the same
 - My peers had similar experiences

Your writing is weaker than you think

- ❖ Strong writing matters, even in STEM
- ❖ Writing improves with deliberate practice

Technical writing tips

- ❖ Maintain objectivity
 - Write from facts, not opinions
- ❖ Less is more; do not ramble
- ❖ Quantify your statements
 - Use numbers
- ❖ Do not misrepresent or manipulate data
- ❖ Use an appropriate vocabulary
- ❖ Edit, edit, and edit
- ❖ When able, receive feedback

Here are some of the technical writing tips from my book.

Quantify your statements: “The yard was big.” → “The yard was 100 sq ft.”

Do not misrepresent or manipulate data: For example, be careful when scaling y-axes.

Use technical vocabulary: “The material was stiffer than planned.” → “The material had a Young’s modulus that exceeded expectations.”

Which statement best describes the use of computers in engineering?

A) Computers always give correct answers

C) Computers are black boxes that engineers should simply trust

B) Computers are useful, but results depend on assumptions and inputs

D) Computers remove the need for engineering judgment

Chapter 8: Understanding Our Limitations

My most important college lesson

- ❖ Learning the limits of my own knowledge
 - It's cliché to say, "That person knows everything about X."

- ❖ The Dunning–Kruger effect is real
 - The more you learn, the more you realize how much you don't know

Limitations of your approach

- ❖ Understand the assumptions behind the equations and constants you use
 - In STEM, assumptions are often necessary due to real-world complexities

Limitations of the tools you use

- ❖ Computers are not magical black boxes; don't treat them as such
- ❖ When using numerical analysis tools, ask:
 - What governing equations are being used and why?
 - What assumptions are being made and why?

No one knows everything about any subject; there is always more to learn.

Chapter 9: Improve Yourself

Form good habits

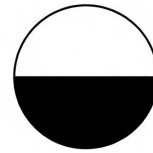
- ❖ Stable schedules improved sales by 7% and productivity by 5% in a study of Gap employees⁷

Ask for help

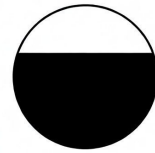
- ❖ Feedback from experienced people accelerates improvement

Stop doubting yourself

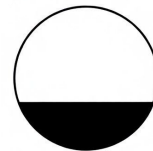
- ❖ You're human, just like everyone else
- ❖ A study comparing 329 aerospace engineers with 18,427 adults found no significant cognitive differences across several domains⁸



1st Circle
High School



2nd Circle
Undergrad



3rd Circle
Grad School



4th Circle
30 Years of
Experience

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Left Column:

- Remember to form good habits. For instance, a study performed on Gap employees took their normal unstable schedules (i.e., schedules that vary day to day) and stabilized them. As a result, sales increased by 7%, and productivity increased by 5%.
- Sometimes I ask questions about things I already know the answer to, or at least thought I did.
- Talk about Drake's circles.
- I knew a guy many would call smart, a dual major in CS and aerospace. Yet he argued a 4.24-second 40-yard dash wasn't fast and wasn't even 1 second per 10 yards, which, for those of us who know, is a ridiculous take. This shows that intelligence in one area doesn't mean understanding in another; he wasn't dumb, just young and inexperienced, arguing in a space he knew very little about.
- A study took 329 aerospace engineers and evaluated several aspects of their cognition relative to the general population (18,427 other adults). There were six domains in total: semantic problem solving, manipulation and attention, memory, spatial problem solving, problem solving speed, and memory recall speed. Aerospace engineers displayed no significant differences relative to the general population.

“People don’t fail; they quit.”
– Unknown

Chapter 10: Reduce Stress

Stop comparing yourself to others

- ❖ Success cannot be measured by outcome alone
- ❖ Everyone's situation is different
 - Life circumstances matter (family, health, responsibilities, goals)

Stop worrying about a bad grade

- ❖ Most students perform poorly on an exam or two at some point
- ❖ High GPAs can help early in your career
 - Admission to college or graduate school
 - First job at a well-known company
- ❖ After a few years of experience, GPAs hold little weight

Get 7–9 hours of sleep per night

- ❖ A 2021 study found those sleeping ≤ 6 hours were $\sim 2.5\times$ more likely to experience frequent mental distress⁹
- ❖ More sleep led to 20% faster typing and 35% greater accuracy¹⁰

Saying “No” is a time-management strategy

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Right Column:

Imagine two students who both earned a bachelor's degree: one worked full-time from a broken home, while the other had strong financial and family support. Most would agree the first student's path is more impressive, even if it took longer or included a slightly lower GPA. Circumstances matter.

Emphasize that there are several other strong differentiators:

- Earning an advanced degree (e.g., a master's)
- Attending a university with strong name recognition (e.g., Harvard, Yale)
- Building a portfolio of meaningful, job-relevant projects
- Gaining experience with well-known employers (e.g., SpaceX, NASA)
- etc.

Left Column:

A test group had a 20% increase in speed and a 35% improvement in accuracy when learning a sequence on a keyboard, compared to the control group that was told to sleep less but practice more.

If you have an exam next week, stay home Friday night to study.

“Comparison is the thief of joy.”

– Theodore Roosevelt

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If you keep comparing yourself to someone else's highlights or, in some cases, a made-up story, you may never be happy

Chapter 11: Additional Information

Computer programming is easier than it appears

- ❖ Like learning a sport, instrument, or other skill
- ❖ Start with a very small project
- ❖ Gradually build to slightly harder projects
- ❖ Use free online resources (e.g., YouTube) to learn

Learn how to budget

- ❖ Don't spend every dollar you earn
- ❖ Budgeting is important in college and life

Practice using spreadsheet programs during college

Opinion vs. Advice

- ❖ Opinion → from someone without experience
- ❖ Advice → from someone with experience

Build systems to help you succeed

- ❖ Design systems that support your goals
- ❖ Example: Don't buy unhealthy food for your home

You are responsible for your successes and failures

Left Column:

Start by making a program that prints to the screen. Then add a for loop that counts, and slowly add one feature at a time.

Right Column:

Of course, opinions still have merit and may be the only information you can collect. But try to seek advice when possible.

Example of a system: Don't buy unhealthy food for your home. If it isn't in the house, you can't eat it. I have much more willpower at the store (when buying) than at home (when eating).

Appendix: Resources

Free tools for STEM students

The author's website

- ❖ JustinRittenhousePhD.com

Productivity/Homework

- ❖ WolframAlpha (wolframalpha.com)
- ❖ LibreOffice (libreoffice.org)

Programming

- ❖ Anaconda (anaconda.com)
- ❖ Octave (gnu.org/software/octave)

Compatibility

- ❖ WineHQ (winehq.org)

CAD / Simulation

- ❖ FreeCAD (freecad.org)
- ❖ CalculiX (calculix.de)
- ❖ ParaView (paraview.org)

Random

- ❖ OBS Studio (obsproject.com)
- ❖ VirtualBox (virtualbox.org)

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- Here's a sample of the resources I list in the book.
- Note that a great way to find free alternatives to costly proprietary software is by simply searching "open source alternatives for NAME OF PROPRIETARY SOFTWARE."

I plan on updating my website with resources, and you can email me there with any questions.

While WolframAlpha can do a lot more, it is a fantastic tool for math homework.

Wine allows Windows applications, including games, to run in Linux. Of course, it's free and open-source, too.

Conclusion

We covered a lot today
There is much more in the book

But if you remember only one thing...

You're human
Just like everyone else

No one is inherently more capable than you

STOP DOUBTING YOURSELF

Thank You

Thank you for your time and attention!

- ❖ I truly appreciate everyone who takes the time to read my book or listen to this presentation
- ❖ If you found this useful and informative, please share it with friends, family, teachers, or students who may benefit
 - If you read the book, don't forget to leave an online review
- ❖ Questions?
 - Reach out via my website (JustinRittenhousePhD.com) or LinkedIn

Or leave a comment below

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9. Amanda Blackwelder, Mikhail Hoskins, and Larissa Huber. Effect of inadequate sleep on frequent mental distress. Online, June 2021.
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To give some context on depth, these slides include only 10 references, while the book has 79 (show the book and flip to the final references page). I don't want to mislead anyone; the book doesn't have eight times more content, since we've covered many of the major topics here, though not all. That said, in addition to extra topics, the book goes into much greater detail on the topics we did discuss.